# IN SILICO DESIGN OF RNA NANOPARTICLES

## SUMMARY

The National Cancer Institute's Nanobiology Program is seeking statements of capability or interest from parties interested in licensing or collaborative research to co-develop, evaluate, or commercialize RNA nanostructures.

## REFERENCE NUMBER

E-059-2009

## PRODUCT TYPE

- Therapeutics

## KEYWORDS

- nanotechnology, nanobiology
- RNAi, nanoparticle

## COLLABORATION OPPORTUNITY

This invention is available for licensing and co-development.

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## DESCRIPTION OF TECHNOLOGY

RNA nanoparticles have the potential to serve as excellent drug or imaging delivery systems due to their designability and versatility. Furthermore, the RNA nanoparticles of the invention are also capable of self-assembly and potentially form nanotubes of various shapes which offer potentially broad uses in medical implants, gene therapy, nanocircuits, scaffolds and medical testing.

This technology, which was co-invented by researchers at National Cancer Institute's Nanobiology Program and the University of California at Santa Barbara (UCSB), describes the computational design of various RNA nanoparticles. These polyvalent nanoparticles utilize RNA motifs as building blocks that give the particles their unique characteristics.  The motifs can be pre-defined and chosen to give the particles desired characteristics (e.g. size and shape) tailored for a variety of applications. The polyvalent particles can utilize multiple unique positions to carry functional groups for cell recognition (e.g. cancer cells), therapy and detection. For therapeutic or detection applications the particles typically encompass at least two functional groups, a therapeutic or imaging agent and a targeting agent that will direct the

particles to the targeted tissue.

Proof of concept has been demonstrated computationally and experimentally for a variety of RNA nanoparticle structures, including synthesis of an RNA Nanoring. NCI is seeking collaborators to perform the laboratory testing necessary to translate computational RNA nanoparticle research into therapeutics, diagnostics, and other applications. Collaborations regarding any aspect of the technology will be considered.

## POTENTIAL COMMERCIAL APPLICATIONS
- Cancer therapeutics
- Diagnostic and imaging tools
- Gene Therapy
- Nanocircuits
- Medical Implants

## COMPETITIVE ADVANTAGES

RNA nanoparticles potentially offer advantages compared to other conventional nanoparticles:
- They are compatible with biological systems and thus may be readily used for in vivo applications such as therapeutic and diagnostic.
- They are small and have a potential to move efficiently through biological barriers to a target tissue.
- They have multiple binding sites and thus can readily be conjugated with several functional groups (e.g. therapeutic molecule and targeting molecule).
- They are versatile and can be designed in different shapes and sizes for different applications and can alter their shapes and functionality under different environmental conditions.

## INVENTOR(S)

Bruce Shapiro (NCI)

## DEVELOPMENT STAGE
- Discovery (Lead Identification)

## PATENT STATUS
- **U.S. Filed:** U.S. Provisional Application No. 61,187,495 filed 16 Jun 2009 (rights co-owned by UCSB)

## RELATED TECHNOLOGIES
- E-078-2016

## THERAPEUTIC AREA
- Cancer/Neoplasm